APPENDIX A

RECORD OF DECISION

HASTINGS GROUND WATER
CONTAMINATION SITE
NORTH LANDFILL
HASTINGS, NEBRASKA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VII
KANSAS CITY, KANSAS

AUGUST 2006

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DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Hastings Groundwater Contamination Site
North Landfill
Hastings, Nebraska
CERCLIS ID# NQD980862668

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for Operable Unit 2 (OU 2) of the North Landfill Subsite (Subsite), Hastings Groundwater Contamination Site (Site), located in Hastings, Nebraska. The remedy has been selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§9601 et seq., and the National Contingency Plan, 40 CFR Part 300. This decision is based on the Administrative Record for OU 2 of the Subsite.

The state of Nebraska concurs with the selected remedy. A letter from the state of Nebraska stating its concurrence is included in this Record of Decision (ROD).

ASSESSMENT OF THE SUBSITE

The response action selected in this ROD is necessary to protect the public health and welfare or the environment from actual or threatened releases of hazardous substances, pollutants, and/or contaminants into the environment from OU 2 which may present an imminent and substantial endangerment.

DESCRIPTION OF THE REMEDY

The selected remedy is intended to be the final response action for the Subsite and addresses all contamination associated with the principal threats posed by OU 2. Specifically, the selected remedy addresses volatile organic compound (VOC) contamination identified in the groundwater emanating from the Subsite.

The major components of the selected remedy include:

- Natural Attenuation (NA) – The use of NA serves to reduce the concentration of contaminants in the groundwater through naturally occurring physical, chemical, and biological processes while employing an extensive monitoring and data evaluation process.

- Groundwater Use Restrictions – This ROD assumes that institutional controls (ICs) that have been implemented as part of the Area-Wide Consent Decree for this Site and the Hastings City Ordinance No. 3754 will remain in effect. The purpose of the groundwater use restrictions or ICs is to ensure that the contaminated groundwater will not be used for potable purposes. The restrictions include deed restrictions, well registration, and signage.

- Hydraulic Containment Using Vertical Extraction Wells – The groundwater removal action at the FAR-MAR-CO Subsite includes the extraction of contaminated groundwater at (1) Well D (primary containment), (2) Well IN-05 and Well IN-11 at the Chief Ethanol Plant (secondary containment), and (3) the Whelan Energy Center wells (tertiary containment). Extraction is the process by which contaminated groundwater is pumped out of the aquifer to prevent migration past (downgradient of) the wells. The analytical data indicates the wells listed intercept contaminated groundwater associated with the North Landfill Subsite. Additional monitoring will be conducted to assure containment.

- Use as Non-Contact Cooling Water – The offsite reuse option includes transport to the Whelan Energy Center for use as non-contact cooling water, where the water can be beneficially reused without presenting an unacceptable risk to human or environmental receptors. Pumped groundwater is piped to the Whelan Energy Center where the majority of the pumped water is employed as non-contact cooling water for dry-steam cooling. During the process, the majority of the water and the VOCs are evaporated.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. This remedy also satisfies the statutory preference for treatment as a principle element of the remedy.

Because this remedy will result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited used and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment.

ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary Section of this ROD. Additional information can be found in the Administrative Record for this Site:

- Chemicals of concern (COCs) and their respective concentrations (Section V and VII).

- Baseline risk represented by the COCs (Section VII).

- Cleanup levels established for COCs and the basis for these levels (Section VIII).
- How source materials constituting principal threats are addressed (Sections XII and XIII).
- Current and reasonably anticipated future land-use assumptions and current and potential beneficial uses of groundwater used in the baseline risk assessment and ROD (Section VI).
- Potential land and groundwater use that will be available at the Subsite as a result of the selected remedy (Section XII).
- Estimated capital, annual operation and maintenance, total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (Section XII).
- Key factor(s) that led to selecting the remedy (Sections X and XIII).

AUTHORIZATION SIGNATURE

Cecilia Tapia, Director
Superfund Division

8/25/06
Date

RECORD OF DECISION

DECISION SUMMARY

HASTINGS GROUNDWATER CONTAMINATION SITE
NORTH LANDFILL
HASTINGS, NEBRASKA

PREPARED BY:

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AUGUST 2006

TABLE OF CONTENTS

		PAGE
SECTION I.	SUBSITE NAME, LOCATION, AND DESCRIPTION	1
SECTION II.	SUBSITE HISTORY AND ENFORCEMENT ACTIVITIES	1
SECTION III.	COMMUNITY PARTICIPATION	2
SECTION IV.	SCOPE AND ROLE OF RESPONSE ACTION	2
SECTION V.	SUBSITE CHARACTERISTICS	3
SECTION VI.	CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES	6
SECTION VII.	SUMMARY OF SUBSITE RISKS	6
SECTION VIII.	REMEDIAL ACTION OBJECTIVES	9
SECTION IX.	DESCRIPTION OF ALTERNATIVES	9
SECTION X.	COMPARATIVE ANALYSIS OF ALTERNATIVES	11
SECTION XI.	PRINCIPAL THREAT WASTES	12
SECTION XII	SELECTED REMEDY	12
SECTION XIII.	STATUTORY DETERMINATIONS	13
GLOSSARY		15

LIST OF FIGURES

		PAGE
FIGURE 1.	SUBSITE LOCATION	17
FIGURE 2.	MONITORING AND PROTECTION WELLS USED TO CHARACTERIZE AND EVALUATE THE NORTH LANDFILL	18
FIGURE 3.	CROSS SECTION SHOW FILL	18
FIGURE 4.	EAST-WEST GEOLOGIC CROSS SECTION	19
FIGURE 5.	LOCATION OF EAST-WEST GEOLOGIC CROSS SECTION	19
FIGURE 6.	TCE CONCENTRATIONS IN SHALLOW GROUNDWATER DOWNGRADIENT OF THE NORTH LANDFILL SUBSITE	20

LIST OF TABLES

TABLE 1	HISTORIC SAMPLING RESULTS	21
TABLE 2	SUMMARY OF TOXICITY VALUES USED	22
TABLE 3	POTABLE EXPOSURE ASSUMPTIONS FOR OU 2 GROUNDWATER	22
TABLE 4	OU 2 GROUNDWATER: COMPARISON OF SITE CONCENTRATIONS TO RISK-BASED ACCEPTABLE CONCENTRATIONS	22
TABLE 5.	APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (ARARs)	23
TABLE 6.	COMPARISON OF ALTERNATIVES	24
TABLE 7.	COST ESTIMATE FOR SELECTED REMEDY	26

SECTION I. SITE AND SUBSITE NAME, LOCATION, AND DESCRIPTION

The North Landfill Subsite (Subsite) is one of the seven subsites that constitute the Hastings Groundwater Contamination Site (Site). The Site, located primarily in Adams County, Nebraska, covers the central industrial area of the city of Hastings (City) and adjacent areas outside of the city limits. The Subsite lies east of the city limits on U.S. Highway 6, as shown on Figure 1. The Subsite is bound by the Burlington Northern Santa Fe Railway's right-of-way to the north; U.S. Highway 6 to the south; Midwest Engines, Becker Transportation, and several large grain elevators to the east; and a construction facility and EZ Storage to the west.

The U.S. Environmental Protection Agency (EPA) and the Nebraska Department of Environmental Quality (NDEQ) have identified the Site as a hazardous waste site requiring management within the respective federal and state programs known as Superfund. The federal Superfund law is the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended (CERCLA), 42 U.S.C. §§ 9601 *et seq.* In 1986, the Site was listed on the National Priorities List. The EPA identification number assigned to this Site—NQD980862668—is utilized in the EPA's electronic database known as the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS III).

As a Superfund project, the Subsite was divided into two operable units (OUs): (1) OU 10 addresses the soil at the North Landfill, and (2) OU 2 addresses the contaminated groundwater associated with the North Landfill. The location of the North Landfill is shown in Figure 2. The focus of this Record of Decision (ROD) is OU 2.

SECTION II. SUBSITE HISTORY AND ENFORCEMENT ACTIVITIES

The Subsite contamination is linked to the disposal of municipal and industrial wastes that occurred at the landfill between 1961 and 1964 when it was operated by the City under a state permit. The Subsite was formerly used as a clay source for local brick makers before the City leased it for use as a landfill. Investigations at the Subsite began in 1984, after the Nebraska Department of Health (NDOH) and NDEQ initiated city-wide sampling that led to the discovery of groundwater contamination at upgradient subsites. In 1989, the City entered into an Administrative Order on Consent (Consent Order) with the EPA to complete a Remedial Investigation (RI) and perform a Feasibility Study (FS) for OU 2 and OU 10. In January 1991, the City submitted an RI Report amended by the EPA in February 1991. In July 1991, the City submitted an FS Report which the EPA approved. The EPA issued an interim action ROD for OU 10 and OU 2. The OU 10 source control interim remedy selected was upgrading the landfill cap and installing fencing.

The OU 2 groundwater interim remedy selected was extracting and treating groundwater. The ROD established interim cleanup levels for Subsite chemicals of concern (COCs) in groundwater based on a risk level of 1×10^{-4}.

The City performed the design for OU 10 source control pursuant to a 1992 Consent Order. In 1998, pursuant to a Consent Decree, the City and other potentially responsible parties (PRPs) implemented the interim remedial action for the source control operable unit. No further work to address source control on OU 10 is necessary.

The EPA deferred the implementation of the OU 2 groundwater interim remedial action in order to evaluate the effectiveness of the groundwater removal action underway at the FAR-MAR-CO Subsite, located adjacent to and downgradient of the North Landfill. The FAR-MAR-CO removal action included the pumping and treating of the groundwater at Well D; pumping Wells IN-05 and IN-11 at the Chief

Ethanol Plant; and wells A, B, and C at the Whelan Energy Center. After reviewing data collected during five years of operation of Well D, the EPA concluded that the FAR-MAR-CO groundwater removal action had successfully reduced risk associated with the trichloroethylene (TCE) plume (a COC at both the North Landfill and FAR-MAR-CO) to less than 1×10^{-4}. Therefore, implementation of the interim remedial action selected by the EPA in the 1991 interim remedial action ROD for the North Landfill was no longer necessary.

In 2004, the North Landfill PRPs entered into a Consent Order to perform an FS for a final remedial action for OU 2. The FS relied on information compiled in the 1991 RI, the Addendum to the 1991 RI, and groundwater data collected between 1991 and 2002. The EPA approved the FS Report in March 2006 and proposed a final remedy for OU 2 in April 2006.

SECTION III. COMMUNITY PARTICIPATION

The Proposed Plan for OU 2 was released to the public on April 10, 2006. The Administrative Record, which included the RI and FS Reports and the Proposed Plan, was made available for public review at the information repositories maintained at the Hastings Public Library and the EPA's Region 7 Records Center located in Kansas City, Kansas. The notice of availability for these documents was published in the *Hastings Tribune* on April 11 and April 15, 2006. The public comment period on these documents continued for 30 days (from April 10 to May 9, 2006.

A public meeting was convened by the EPA on April 17, 2006, in the Hastings Public Library. Approximately 1,100 Fact Sheets sent to citizens of Hastings advised of this opportunity to hear a summary of the Proposed Plan, to provide comments, and to ask questions concerning the investigations or remedial alternatives. At this meeting, the EPA representatives answered questions about Site conditions and the remedial process. A transcript of the public meeting was made. The EPA response to the comments received during the public comment period is included in the Responsiveness Summary attached to this ROD. In summary, the public participation requirements as defined in CERCLA §§ 113(k)(2)(B)(i-v) and 117 and 40 C.F.R. § 300.430(f)(3) were satisfied.

During the RI/FS process, the EPA solicited a wide cross section of community input on the reasonably anticipated future land use and potential beneficial groundwater uses at the Site. Efforts to address this issue included community interviews during the development of the Community Involvement Plan (July 2002), multiple meetings with city officials in the Public Works organization and committee, and the public meeting.

This decision document presents the selected remedial action for OU 2 of the Subsite located in Hastings, Nebraska. The remedial action was chosen in accordance with the provisions of CERCLA and the National Contingency Plan (NCP). The selection of this final response action for OU 2 is based on the Administrative Record.

SECTION IV. SCOPE AND ROLE OF RESPONSE ACTION

This ROD addresses volatile organic compound (VOC) contamination of groundwater emanating from the Subsite. Ingestion of water extracted from OU 2, a contaminated portion of the aquifer, poses a potential future risk to human health because the EPA's acceptable risk range is exceeded, and concentrations of contaminants are greater than the maximum contaminant levels (MCLs) for drinking water (as specified in the Safe Drinking Water Act [SDWA]). Response actions have been completed at OU 10. This ROD for OU 2 presents the final response action anticipated by the EPA for the Subsite.

SECTION V. SUBSITE CHARACTERISTICS

The RI consists of a body of information compiled between 1991 and 2002. The FS fieldwork, analyses of data, and reports were completed in March 2006. Together the RI and the FS identified the horizontal and vertical extent of the OU 2 groundwater contaminant plume, evaluated the corresponding risks to human health and the environment, and developed methods to address the contamination. The following sections summarize the results and conclusions developed during the RI and the FS.

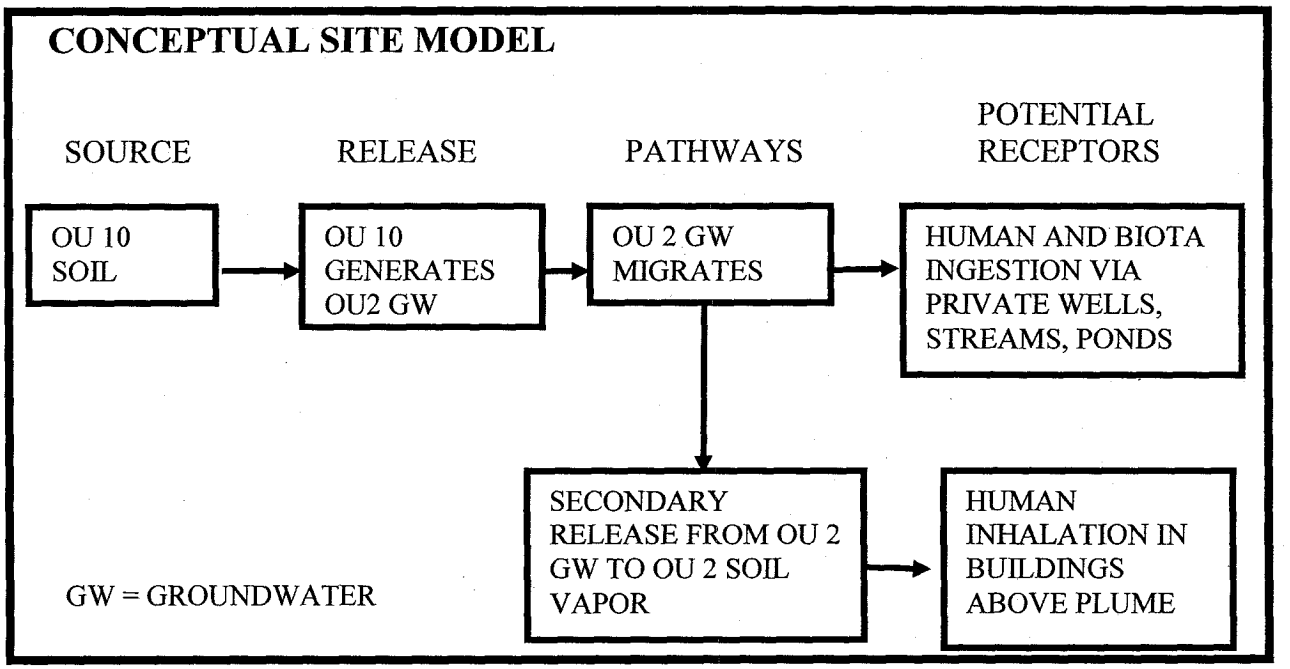
OVERVIEW OF OU 2

The Subsite is located in an area (comprised primarily of mixed industrial and agricultural uses) in the Loess Plains of the Great Plains physiographic province. The area west of the landfill and inside the city limits is zoned for residential use. The Subsite occupies approximately 13.4 acres east of the city limits on U.S. Highway 6. It is bound by the Burlington Northern Santa Fe Railway's right-of-way to the north and U.S. Highway 6 to the south. Midwest Engines, Becker Transportation, and several large grain elevators are east of the Subsite, and a construction facility and EZ Storage are located immediately to the west.

Surface water features in the Hastings area include perennial and intermittent streams, wetlands, and artificial impoundments. Hastings lies on the surface water divide between south–to-southeastward flowing tributaries to the Little Blue River and north-to-northeastward flowing tributaries to West Fork Big Blue River. These tributaries are: Big Sandy Creek, located southeast of Hastings; Pawnee Creek, which flows from the northwest to the southeast; and Thirty-two Mile Creek, to the southwest of Hastings. The EPA has no data to indicate surface waters have become contaminated by COCs emanating from OU 2.

CONCEPTUAL SITE MODEL

The conceptual site model describes the projected contaminant source(s), release mechanism(s), exposure pathway(s), and potential receptors for a site. The sampling program, risk assessment, and response actions are based upon the conceptual site model. For OU 2, the conceptual site model is presented below.



SAMPLING STRATEGY

Fieldwork was implemented in four phases between 1985 and 1990. The following data types were identified as the focus for the fieldwork: (1) soil and soil gas survey to characterize the nature and extent of the old landfill and resultant contamination, (2) geologic and hydrogeologic to define the soil stratigraphy and aquifer system, and (3) groundwater contamination to define the horizontal and vertical extent of the plume.

GEOLOGIC AND HYDROGEOLOGIC RESULTS

- The stratigraphy includes several units:
    1) The first unit is the Peoria Loess, composed of a light brown to white eolian silt, ranging from 10 to 40 feet in thickness and is disconformably separated from underlying units by the Sangmonian Interglacial hiatus.
    2) The second unit is the Loveland Loess, a reddish-brown calcareous silt with minor amounts of sand and clay. The formation ranges from 0 to 60 feet in thickness. Clay content decreases with depth and the basal unit consists of clean silt.
    3) The third unit is the Sappa Formation, deposited during the Kansan Glacial Stage. Generally, the Sappa Formation consists of 50 feet of silt and fine-grained sand, with a middle zone of fine to very coarse sand and gravel. The formation is fairly continuous beneath the Site. The Sappa Formation is mostly sand west of the eastern City limits and mostly silt and clay east of the City limits. A volcanic ash layer (the Pearlette Ash Member) may occur at the bottom of the formation. The Sappa silts are distinguished from the overlying Loveland and Peoria silts by the inclusion of glassy shards due to reworking of the basal volcanic ash layer.
    4) A brownish-gray or gray silty clay, clayey silt, silt, or sandy silt containing lenses of sand overlie bedrock in large areas of western Clay and eastern Adams County. Boring logs indicate this deposit commonly floors the Pleistocene sediments in Hastings.
    5) The Cretaceous-age Niobrara Formation disconformably underlies Pliocene/Pleistocene sediments in the Hastings area and is up to 300 feet thick. This formation consists of yellow and light-to-dark gray chalky shale, limestone, and chalk. The shales of the Niobrara act as an effective aquiclude at the base of the overlying aquifer where the sands are deposited directly upon this formation.

- The regional aquifer in the vicinity of Hastings, informally known as the Pleistocene aquifer, occurs within sands and occasionally gravels, and is located stratigraphically beneath the Sappa Formation. Across the Site, groundwater is typically encountered at depths that range from 110 to 135 feet below ground surface (bgs). The aquifer extends to depths of about 200 to 220 feet bgs and the saturated thickness ranges from 65 feet on the western edge of the Site to approximately 100 feet to the southeast. Paleotopography developed on top of the Niobrara accounts for the variation in saturated thickness of the overlying Pleistocene aquifer. The aquifer is considered unconfined based on the location of the potentiometric surface relative to potential discontinuous confining zones or layers and the response of the aquifer to pumping. The aquifer can yield large volumes (500 to more than 2000 gallons per minute [gpm]) of water to wells, and is the principal source of drinking, irrigation, and industrial water in the Hastings area. The Pleistocene aquifer media consists predominantly of unconsolidated well-graded, medium-grained sands with some

interbedded lenses of sandy gravel. In certain areas, a fine-grained layer (a silty clay) is found near the top of the aquifer at approximately 125 to 135 feet bgs.

- Water levels have been measured since 1934 in a United States Geological Survey recorder well located in the southwest portion of the Site. Measurements indicate water levels have declined approximately 15 feet since the 1930s. In addition, a seasonal trend in water level fluctuation is evident with an approximate five-foot decline occurring during the summer months (due to irrigation) and recovery during the winter months. Hydraulic gradients typically range from 0.001 to 0.002 feet/feet across the Site, the direction of flow is toward the east with a slight southeasterly course. Variations occur in the vicinity of pumping wells (such as municipal, irrigation, and industrial wells) and recharge areas.

- The hydraulic conductivity and transmissivity of the Pleistocene aquifer have been measured by previous investigators at various subsites within the Site. Based on data from municipal wells, the local hydraulic conductivity has been estimated to range between 22 and 275 feet per day (ft/day). Pumping tests conducted in unconsolidated sand and gravel sediments east of Hastings indicated a transmissivity value of 24,500 square feet per day (ft^2/day) and a hydraulic conductivity of 200 ft/day. A 67-hour pumping test was conducted in irrigation well I-49 in January 1994. The test demonstrated the transmissivity of the aquifer is about 23,000 ft^2/day. Pumping tests performed at the other subsites have provided hydraulic conductivity values in a similar range. Combining the estimated transmissivity with the hydraulic gradient and porosity results in a groundwater flow velocity at the Site that ranges from about 0.5 to 1.5 ft/day (350 to 500 feet per year).

GROUNDWATER CONTAMINATION RESULTS

- The Interim Action ROD for OU 2 listed 1,1-dichloroethene (DCE); 1,2-DCE, vinyl chloride (VC) trichloroethene (TCE); 1,1,1-trichloroethane (TCA); tetrachloroethene (PCE); and benzene as COCs for the North Landfill. All were detected at or near the Subsite during the period from May 1985 to September 1990 (the year the ROD was issued).

- From 1995 to 2002, quarterly groundwater levels and VOC data were collected to evaluate the performance of pumping Well D as an interim groundwater action for the North Landfill and FAR-MAR-CO Subsites. Additional monitoring for VOCs has been conducted from 2002 to present.

- Two plumes have been identified below the Subsite. A deeper plume containing TCE; cis 1,2-DCE; 1,1-DCE; PCE; and 1,1,1-TCA is present from approximately 145 to 175 feet bgs. The deeper plume is distinguished by high TCE concentrations; the presence of 1,1-DCE; and a very low cis 1,2-DCE to TCE ratio. The second plume is shallower with a zone of impact from approximately 120 to 140 feet bgs containing TCE; cis 1,2 DCE; and VC. The shallow plume is identified by lower TCE concentrations, a high (greater than 1) cis 1,2-DCE to TCE ratio; and the presence of VC. The EPA has concluded the shallower plume emanates from the North Landfill Subsite while the deeper plume emanates from other sources.

- Monitoring wells MW-6 and MW-25 provide data for the shallow plume and are believed to monitor Subsite groundwater. The presence of TCE breakdown products (cis 1,2-DCE and VC) together with the history of the change in the cis 1,2-DCE to TCE ratio in the above monitoring wells suggest residual TCE in groundwater in the vicinity of the North Landfill is being naturally degraded. In addition, TCE concentrations in MW-6 have decreased from 108 micrograms per liter (ug/L)

(March 1998) to 45 ug/L (March 2005) and in MW-25 from 178 ug/L (March 2000) to 49 ug/L (March 2005).

- Analyses of groundwater data indicate the center of the North Landfill plume is in the center of the Well D capture zone and that Well D is providing hydraulic control of the distal portion of the plume. The pumping of Well D along with natural attenuation appear to have been effective in reducing contamination in the OU 2 plume, although recent data have shown some reversal of that effect. (The EPA believes this is a temporary phenomenon.) COCs in OU 2 have been reduced through extraction to less than 1 x 10^{-4} target concentrations.

- Monitoring wells MW-17, NP-001R, and GM-2D provide data for the deep groundwater plume and are believed to represent a plume originating from other sources. The lower concentrations of cis 1,2-DCE and lack of VC suggest that degradation is not occurring to the same degree in the deeper plume. TCE concentrations in GM-2D have increased from 1,040 ug/L (June 1995) to 1,641 ug/L (March 2005).

SECTION VI. CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

GROUND AND SURFACE WATER USES

Groundwater is the primary source for drinking water utilized by the City, both now and in the future. Currently, private wells in OU 2 are not used for potable purposes. Use restrictions are in place to prevent residential/potable water wells being installed in the OU 2 area in the future. The aquifer is an excellent source of groundwater.

The Subsite is located within the Institutional Control Area (ICA) established under the Area-Wide Consent Decree for the Site (Civil Action No. 8:03CV531). Institutional controls (ICs) are being maintained as a requirement of the Area-Wide Consent Decree. The ICA encompasses the area in Hastings bound by 12th Street on the north, Maxon Avenue on the east, J Street on the south, and Crane Avenue on the west. The ICs include monitoring the wells within the ICA, posting warning signs regarding the contamination of the groundwater, and providing alternate water to any resident whose private well is contaminated above health-based levels. In addition to these ICs, the City has enacted an ordinance which requires well registration for the purpose of monitoring and restricts the installation of wells within the ICA.

Surface water bodies in the area include creeks and ponds. Many of the creeks and ponds are intermittent and not sufficient as perennial sources of water. Among all RI-phase water samples, the data indicate that VOCs occur only in groundwater, not surface water.

SECTION VII. SUMMARY OF SUBSITE RISKS

As part of the RI/FS process, a Baseline Risk Assessment was developed to estimate the human health and environmental risks associated with possible exposure to contaminants identified at OU 2.

The Baseline Risk Assessment was conducted in accordance with all relevant and current the EPA risk assessment guidance: COCs were identified, toxicities of these chemicals were reviewed, potential exposures were defined, and risk characterization was quantified. This analysis provided valuable information used to determine the need for remedial actions. The purpose of this section is to summarize the results of the assessment. For more information, readers are referred to the actual report which is included in the Administrative Record.

This section presents the two risk categories—human health and ecological—separately.

HUMAN HEALTH RISK ASSESSMENT

As presented earlier in the Site Characteristics Section, the conceptual model for OU 2 identified two potential pathways for contamination to pose risks to human health: groundwater and air. The remainder of the human health subsection will address these two pathways separately.

Groundwater Pathway

Identification of Chemicals of Concern (COCs)

The initial step involved reviewing OU 2 groundwater concentrations from historical analytical data. Three VOCs (vinyl chloride, cis 1,2-DCE, and TCE) were reported as associated with the shallower North Landfill-associated aquifer. The other VOCs (1,1-DCE, TCA, PCE, and benzene) originally included on the list of COCs have been determined to be associated with the deeper plume.

As a result, the three contaminants included on the revised list of COCs are:

- VC
- Cis 1,2-DCE
- TCE

Exposure Assessment

The exposure assessment was accomplished through the identification of exposure pathways and the development of exposure scenarios. Under current conditions, no complete exposure pathway for groundwater was identified as no private drinking water wells are located in the affected area. The OU 2 testing data indicate VOCs associated with the North Landfill Subsite are not impacting Hastings' municipal wells.

For reasonably anticipated future uses, the assumption was made that a drinking water well could be placed into the affected area. As a result, consumption is a potentially complete exposure pathway.

The exposure assessment for groundwater includes two reasonable maximum exposure scenarios:

- Future potable uses of the contaminated aquifer in OU 2 through installation of a private drinking water well.

- Future inhalation of groundwater contaminants which volatilize and migrate up through the soils into new buildings (residential or commercial) constructed on properties above the North Landfill plume.

Toxicity Assessment

Both the potential for carcinogenic health risk, as well as noncarcinogenic health risk, are evaluated as part of the toxicity assessment.

The EPA has classified VC as a known human carcinogen. The EPA has not classified cis 1,2-DCE as a human carcinogen. With respect to TCE, the EPA is reviewing two of the agency's earlier characterizations as to its carcinogenicity: (1) highly likely to produce cancer in humans, and (2) probable human carcinogen. However, the EPA has not finalized its characterization.

The EPA evaluates the potential for noncarcinogenic health risk by comparing estimated contaminant intake to a reference dose (a dose of a given chemical that has previously been tested for health effects). The EPA's Integrated Risk Information System (IRIS) specifies contaminant-specific reference dose values that have been verified by an intra-agency work group. Values that have not been verified by the work group are presented within the EPA's Health Effects Assessment Summary Tables (HEAST). The ratio of contaminant intake to the reference dose is referred to as the hazard quotient or hazard index. A hazard quotient greater than one indicates a hazard to humans may be likely to exist. The potential for carcinogenic risk is estimated by multiplying estimated contaminant intake by an established slope factor (a value established by previous testing to determine the degree to which chemicals cause cancer obtained from the EPA's

IRIS and HEAST database) for each contaminant (Table 2). The resulting figure represents the chance that a human would develop cancer in excess of the normal background cancer rate. For example, an excess risk of one in 10,000 (represented as 1×10^{-4}) indicates that one additional person may contract cancer out of 10,000 people identically exposed to a contaminant. A cancer risk greater than one in 10,000 (1×10^{-4}) is considered unacceptable by the EPA and requires remedial action. A cancer risk less than one in 1,000,000 (1×10^{-6}) is considered acceptable. The cancer risk range between 1×10^{-6} and 1×10^{-4} is considered acceptable unless specific conditions warrant otherwise. The calculated carcinogenic risks are viewed as conservatively high due to the EPA's carcinogenic risk assessment methodology.

Risk Characterization

Default exposure assumptions have been derived and published by the EPA for potable uses. Exposure assumptions for potable uses include ingestion of the contaminated groundwater, dermal absorption, and inhalation of volatile chemicals based on household water uses such as showering, laundering, etc. Table 3 presents the exposure assumptions used for potable uses of OU 2 groundwater.

Finally, as presented in Table 4, actual Subsite data (maximum concentrations) were compared to risk-based, potable water criteria. Subsite concentrations exceed the risk-based concentrations for all three COCs. As a consequence, the response action selected in this ROD is necessary to protect human health from actual or threatened releases of hazardous substances into the environment.

ECOLOGICAL RISK ASSESSMENT

The groundwater beneath OU 2 was evaluated for the potential ecological risks associated with contaminants detected in this media. Along with describing the environmental setting and identifying the compounds known or suspected to exist at the Subsite, the fate of the chemicals at the Subsite and the identification of potentially complete exposure pathways are determined. Screening-level estimates of exposure for completed exposure pathways are used to develop preliminary, conservative estimates of risk.

Evaluating potential exposure pathways is one of the primary tasks of the screening-level characterization of OU 2. For an exposure pathway to be complete, a constituent must be able to travel from the source to ecological receptors and to be taken up by the receptors via one or more exposure routes.

One of the EPA's key questions developed in screening-level problem formulation is, "Which habitats present onsite are potentially contaminated or otherwise disturbed?" For OU 2, in order for a habitat to be contaminated or disturbed and thus wildlife receptors to come into contact with Subsite-related compounds, constituents in groundwater must release to surface water bodies (streams, rivers, lakes) or ecological receptors must be in direct contact with the groundwater (e.g., live in the groundwater). Soil contamination was not detected at the North Landfill, over which a cap was installed. Surrounding land includes residential, commercial, industrial, and agricultural property. There are no apparent exposure pathways for environmental receptors to contact landfill soil or groundwater. There are no receptors living in the groundwater and no surface water bodies are located near the Subsite.

The potential for the OU 2 plume to come in contact with resident ecological receptors was evaluated using the available geological and site characterization data. The characterization data shows that groundwater COCs associated with OU 2 are not discharging to surface waters. Since these aquatic habitats necessary for the presence of ecological receptors are not receiving chemicals associated with the OU 2 plume, ecological receptors cannot contact or take up Subsite-related contaminants.

Since there is no complete exposure pathway between the OU 2 plume and any ecological receptors, the constituents detected in the groundwater do not pose an ecological threat.

SECTION VIII. REMEDIAL ACTION OBJECTIVES

Remedial Action Objectives (RAOs) are a description of what the cleanup is expected to accomplish. Often numerical standards are specified. For OU 2, the two RAOs are defined as follows:

- Prevent human exposure to groundwater contaminated above regulatory standards or risk-based standards.
- Restore groundwater to contaminant levels that would allow for its future beneficial use.

As calculated in the Baseline Risk Assessment, unacceptable future risks for OU 2 will be addressed by achieving the RAOs.

Groundwater RAOs are defined by MCLs or risk-based standards for the COCs presented below:

Chemical	MCL, ppb	Risk-Based Standard, ppb
Cis 1,2-DCE	70	61
TCE	5	0.028
VC	2	0.02

SECTION IX. DESCRIPTION OF ALTERNATIVES

To address the RAOs, three alternatives are presented in this section. These alternatives were developed and presented in the FS Report. The selected remedy identified in this ROD will be chosen from the three alternatives.

Costs presented in this section were developed in the FS Report and based on current data, best available vendor information, and professional judgment. Estimated time frames to achieve Applicable or Relevant and Appropriate Requirements (ARARs) and Performance Standards for the contaminated groundwater are based on estimated degradation rates using historic OU 10 data. For a greater level of detail, readers are referred to the FS Report.

DESCRIPTION OF REMEDY COMPONENTS

ALTERNATIVE G-1: NO ACTION

Estimated Capital Cost: $0
Estimated Operation & Maintenance (O&M) Cost: $0
Estimated Present Worth Cost: $0
Estimated Time to Achieve RAO: Not timely

Regulations governing the Superfund program require that a "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, the EPA would take no action at OU 2 to prevent exposure to contaminated groundwater. Natural attenuation (NA) processes would not reduce the plume concentrations at the Subsite as long as there is an upgradient source of TCE contamination and would also not address the portion of the plume that has moved beyond the Subsite. The ICs, part of the Area-Wide Consent Decree requirements, would protect the public from exposure. There would be no monitoring to discern the changes occurring in the levels of contamination in OU 2 and to determine if the remediation goals are achieved.

ALTERNATIVE G-2: GROUNDWATER USE RESTRICTIONS AND NATURAL ATTENUATION

Estimated Capital Cost: $40,500
Estimated O&M Cost: $52,000/year for first two years
Estimated Present Worth Cost: $171,031
Estimated Time to Achieve RAO: Not timely for distal plume

Alternative G-2 involves the use of NA in addition to groundwater use restrictions. Natural attenuation may be defined as physical, chemical, and biological processes that reduce the mass, toxicity, volume, or concentrations of contaminants. This alternative uses NA to reduce the contaminant concentrations in the groundwater while employing an extensive monitoring and data evaluation process. However, NA would not address the high levels of TCE contamination entering the Subsite from an upgradient source.

Historic and recent data for OU 2 indicate that NA is occurring and controlling migration of the OU 2 plume; although, contamination in the portion of the plume east of Showboat Road and west of Well D is not decreasing as a result of NA.

The purpose for the groundwater use restrictions is to prevent exposure to the contaminated plume by prohibiting the construction of private wells. Additional detail about the use restrictions is provided in the *Common Elements* subsection which follows later in this section.

ALTERNATIVE G-3: GROUNDWATER USE RESTRICTIONS, HYDRAULIC CONTAINMENT USING VERTICAL EXTRACTION WELLS, AND USE AS NON-CONTACT COOLING WATER

Estimated Capital Cost: $47,250
Estimated O&M Cost: $93,200/year
Estimated Present Worth Cost: $591,985
Estimated Time to Achieve RAO: 5 years

Alternative G-3 includes the groundwater use restrictions that are included in Alternative G-2, with the addition of continued operation of the downgradient industrial wells and continued pumping of groundwater to the Whelan Energy Center for use as non-contact cooling water. Continued monitoring will demonstrate that the remediation goals have been met or will be met within a reasonable time frame.

Groundwater extraction would be accomplished by Well D (primary containment), Wells IN-05 and IN-11 at the Chief Ethanol Plant (secondary containment), and the Whelan Energy Center Wells A, B, and C (tertiary containment). Containment of the impacted groundwater plume associated with the Subsite would prevent the migration of VOCs that exceed the target concentrations beyond the Subsite and beyond the boundaries of the ICA.

The data indicate that NA processes control migration of the OU 2 plume, provided the upgradient source—which the EPA considers to be a temporary phenomenon—ceases to migrate into the OU 2 plume. Employing the City's power plant needs (for cooling water) is an approach which ensures that OU 2 contaminants are mitigated while the water removed from the aquifer is used beneficially.

COMMON ELEMENTS AND DISTINGUISHING FEATURES OF EACH ALTERNATIVE

The three alternatives include the following common components:

- All alternatives are required to attain the RAO.
- Section 121(d)(2) of CERCLA requires that remedial actions conducted achieve ARARs. The ARARs are legally enforceable federal and state standards, requirements, criteria, or limitations. The ARARs are divided into three types: contaminant specific, location specific, and action specific. A CERCLA remedial action is required to meet the substantive requirements of ARARs for activities conducted onsite. Both substantive and administrative requirements are required when activities occur offsite. Table 5 presents the ARARs for the four alternatives. When jurisdictions overlap on a particular ARAR, the more stringent ARAR applies.
- Performance standards are measurable criteria signifying achievement of the RAO. For OU 2, all alternatives must restore the aquifer to unlimited uses, most notably potable. As documented in the chemical-specific ARARs, contamination throughout the OU 2 aquifer must be reduced to levels which achieve MCLs.
- Neither the "no action" alternative nor Alternative G-2 will ensure the effectiveness of the remedy.
- All three alternatives utilize NA processes to degrade the OU 2 groundwater contamination. Historic and recent data for OU 2 indicate that NA has controlled migration of the OU 2 plume until recent times when data indicate an upgradient source migrating into the Subsite area.

The main distinguishing feature separating the alternatives is the level of protection provided to downgradient receptors by Alternative G-3. The NA processes will be working for all three alternatives (when the upgradient source no longer affects the Subsite). However, Alternative G-1 does not provide any increased level of protection and Alternative G-2, though it provides use restrictions and monitoring, does not control the plume beyond the Subsite. Alternative G-3 provides hydraulic containment using vertical extraction wells and treatment of the extracted water to ensure that contamination will not reach downgradient receptors.

EXPECTED OUTCOMES OF EACH ALTERNATIVE

The expected outcomes of all three alternatives are limited use of the aquifer and the land at the landfill. Alternative G-1 will not achieve RAOs in a timely manner. Alternative G-2 may achieve RAOs for the plume upgradient of Well D, but not that portion of the plume between Showboat Road and Well D. For cost estimating purposes, Alternative G-3 is expected to achieve RAOs within five years.

SECTION X. COMPARATIVE ANALYSIS OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select a preferred remedy. This section of the ROD profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below.

EVALUATION CRITERIA FOR SUPERFUND REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to public health and the environment through ICs, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the Site, or whether a waiver is justified.
Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.
Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.
Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.
Cost includes estimated capital and annual O&M costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.
State/Support Agency Acceptance considers whether the state agrees with the EPA's analyses and recommendations as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with the EPA's analyses and Selected Remedy. Comments received on the Proposed Plan are an important indicator of community acceptance.

Overall Protectiveness and Compliance with ARARs are classified as Threshold Criteria, meaning that alternatives failing to satisfy either of these two criteria will be eliminated from further analysis. The next five criteria on the table above comprise the Balancing Criteria used to rank alternatives against one another. The last two criteria—State and Community Acceptance—are Modifying Criteria which are given serious consideration and which can affect the decision process. A summary of the comparative analysis is presented in Table 6.

SECTION XI. PRINCIPAL THREAT WASTES

Principal threat wastes represent the sources of the hazardous substances that contribute to the unacceptable risk onsite. Principal threat wastes were not identified at OU 2. The OU 2 groundwater contamination has migrated from an area considered a principal threat—OU 10. The OU 10 source materials were identified years ago. The OU 10 remedy addressed the principal threat for the Subsite.

SECTION XII. SELECTED REMEDY

Summary of the Rationale for the Selected Remedy

The EPA and NDEQ have determined the selected remedy for OU 2 is Alternative G-3. This remedy was selected because it offers superior long-term protectiveness when compared with the other alternatives. It is equally implementable as the other alternatives. The cost of Alternative G-3 is higher than either of the other alternatives, but not by so great a margin that cost represents a major impediment to implementation. The selected remedy will provide overall protection of human health and the environment by eliminating, reducing, or controlling all potential risks posed by the exposure pathways at OU 2. The treatment technologies and remedial actions included in the selected remedy will comply with ARARs and achieve performance standards listed in Section VII.

The EPA has observed that due to activities upgradient of the North Landfill Subsite, the concentration of TCE in the groundwater has increased substantially. The EPA believes this is a temporary phenomenon, as evidenced by trends in MW-5 which show TCE concentrations peaking and declining. Until this phenomenon manifested itself, it was apparent that NA processes were effectively decreasing the concentrations of TCE in the groundwater associated with the North Landfill Subsite.

As a consequence of the increased concentration of TCE in the groundwater underlying the North Landfill Subsite, employment of NA and groundwater extraction will need to continue for an undetermined period. Collection of samples from MW-5, MW-6, and MW-7 on a regular basis will provide an opportunity to monitor the groundwater for TCE. Analytical results for these samples should demonstrate a trend of decreasing concentrations of TCE over time. The EPA believes, based on historical data, TCE concentrations will subside to the range at which they were observed before upgradient TCE was intercepted by the North Landfill monitoring wells (20 ppb).

Description of the Selected Remedy

Alternative 3 includes:

- NA – The NA is expected to (1) prevent contamination from reaching downgradient receptors, and (2) reduce the contamination in the aquifer to achieve performance standards. For cost estimating purposes, a cleanup time frame of approximately five years is assumed.

- Monitoring – Groundwater monitoring will be implemented to measure and track (1) the degradation rate(s) of the contamination in the body of the plume, and (2) the boundaries of the plume to verify that it is not expanding. This could include installation of additional properly constructed monitoring wells.

- Groundwater Use Restrictions – Groundwater use restrictions will preclude current or hypothetical future property owners from pumping groundwater for potable use until it is demonstrated through monitoring that the groundwater is suitable for potable use. This measure eliminates the exposure pathway to groundwater. (These restrictions are in

place as part of the Area-Wide Consent Decree.)

- Hydraulic Containment Using Vertical Extraction Wells – Groundwater extraction will be accomplished by Well D (primary containment), Wells IN-05 and IN-11 at the Chief Ethanol Plant (secondary containment), and the Whelan Energy Center Wells A, B, and C (tertiary containment). Containment of the impacted groundwater plume associated with the North Landfill Subsite will prevent the migration of VOCs that exceed the target concentrations beyond the boundaries of the ICA.

- Use As Non-Contact Cooling Water – The VOCs associated with OU 2 will be treated or destroyed as part of the process at the Whelan Energy Center, wherein the water is used as cooling liquid, after which the VOCs are stripped as the water is processed through a cooling tower.

Summary of the Estimated Remedy Costs

The total present worth cost estimate for the selected remedy is $591,985. The cost estimate assumes five years is the time required to achieve the performance standards in the aquifer. Table 7 contains a detailed accounting of costs for the selected remedy including capital and O&M.

The information in this cost estimate summary table is based on the best available information regarding the anticipated scope of the remedial alternative. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record and Explanation of Significant Differences document, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within +50 to -30 percent of the actual project cost.

Expected Outcomes of the Selected Remedy

For cost estimating purposes, it is assumed that five years will be required to achieve performance standards in the OU 2 aquifer. After achieving performance standards, OU 2 groundwater will be suitable for unrestricted uses including but not limited to drinking water supply and commercial/industrial applications. Performance standards for groundwater are the MCLs established under the SDWA.

SECTION XIII. STATUTORY DETERMINATIONS

Under CERCLA §121 and the NCP, the lead Agency must select remedies that are protective of human health and the environment, comply with ARARs, are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against offsite disposal of untreated wastes. The following sections discuss how the selected remedy meets these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy through use of NA, groundwater use restrictions, hydraulic containment using vertical extraction wells, and use as non-contact cooling water will protect human health and the environment. The unacceptable future risks associated with VOCs in groundwater will be reduced to within acceptable levels by treating groundwater to below MCLs using NA and aeration. Short-term risks will be addressed by use restrictions barring well construction in the area of the contaminated aquifer in OU 2, thereby preventing exposure to contaminated groundwater.

COMPLIANCE WITH (ARARs)

The selected remedy of NA, groundwater use restrictions, hydraulic containment using vertical extraction wells, and use as non-contact cooling water complies with all ARARs. The ARARs are presented below and in more detail in Table 5.

Chemical Specific: Action-specific ARARs include the following:

- Federal SDWA MCLs, 40 CFR §§ 141.50-141.51 and 40 CFR §§ 141.11-141.16
- Groundwater Quality Standards and Use Classifications, Title 118

Location Specific:

Location-specific ARARs are requirements that might apply to a remedial action due to the site's unique cultural, archaeological, historical, or physical setting. Location-specific ARARs will not apply to the groundwater final remedial action at the Subsite because there are no such features in the Subsite area.

Action Specific:

- Groundwater Monitoring:

  The substantive groundwater monitoring requirements are relevant and appropriate as specified in RCRA 40 CFR 264, Subpart F.

- Air Stripping:

  The use of air stripping with no emission controls results in the discharge of VOCs into the atmosphere. The NDEQ's Title 129 limits discharges of VOCs to 2.5 tons/year. Air emissions will comply with the Clean Air Act, 33 U.S.C. §§ 1251 et seq. as well as NDEQ's Title 129, Air Pollution Control Regulations.

COST EFFECTIVENESS

The selected remedy is cost effective and represents a reasonable value for the expenditure required. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness" [NCP § 300.430(f)(1)(ii)(D)]. The determination of cost effectiveness was made by evaluating the overall effectiveness of the selected remedy and comparing that to the costs of its implementation. The conclusion supported the determination that the selected remedy is cost effective.

The estimated present worth cost of the selected remedy is $591,985. Alternative 1 has no costs associated with it but it is not protective. Alternative 2 is less expensive than Alternative 3 but would provide significantly less protection to potential receptors of VOC-contaminated groundwater, and would require substantially more time to remediate the groundwater contamination to below MCLs. The EPA believes the selected remedy's addition of the groundwater extraction and treatment through its use as non-contact cooling water is the best available alternative.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES TO THE MAXIMUM EXTENT

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at OU 2. The selected remedy provides the best balance of trade-offs in terms of the five balancing criteria. It is protective of human health and the environment, complies with ARARs, and also considers the statutory preference for treatment as a principal element with bias against offsite treatment and disposal. The selected remedy has acceptance from the community and the state.

Relative to other alternatives, the selected remedy offers a comparable level of long-term effectiveness and an acceptable reduction of volume and mobility through treatment. Extraction and NA will reduce the contamination levels in the OU 2 aquifer to MCLs. Treatment of extracted groundwater through use as non-contact cooling water will ensure that VOCs are adequately destroyed. Groundwater use

restrictions will prevent the public from utilizing contaminated groundwater.

PREFERENCE FOR TREATMENT

Principal threats do not exist in OU 2 as defined by CERCLA.

As documented, extraction of contaminated groundwater via Well D and other wells is reducing the concentration of VOCs in the aquifer, and NA is contributing to the remediation process. The statutory preference for remedies that employ treatment as a principal element is satisfied by Alternative 3. Extraction of water and use of the extracted water as non-contact cooling water is a significant portion of this remedy.

FIVE-YEAR REVIEW REQUIREMENT

Because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining on the Subsite above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of the remedial action to ensure the remedy is, and will be, protective of human health and the environment. The five-year review process was initiated with the submission of the Five-Year Evaluation Report of the Performance of Well D for the FAR-MAR-CO Subsite in December 2002. The next sequential submission of this document will be in December 2007. Because this document deals with Well D, it is appropriate that it be considered as accommodating the five-year review requirement for the Subsite as well.

GLOSSARY

Specialized terms used in this ROD are defined below:

Administrative Order on Consent (Consent Order): In this ROD, the Consent Order is a legal agreement signed by the EPA and a PRP that requires the PRP to perform a response action that is necessary as a result of a release or threat of release of hazardous substances.

Administrative Record (AR): The body of documents that *forms the basis* for selection of a particular response at a site. An AR is available at or near the site to permit interested individuals to review the documents and to allow meaningful public participation in the remedy selection process.

Aquifer: An underground layer of rock, sand, or gravel capable of storing water within cracks and pore spaces or between grains. When water contained within an aquifer is of sufficient quantity and quality, it can be used for drinking or other purposes. The water contained in the aquifer is called groundwater.

Applicable or Relevant and Appropriate Requirements (ARARs): The federal and state environmental laws that a selected remedy will meet.

Capital Costs: Expenses associated with the initial construction of a project.

Chemicals of Concern (COCs): Chemicals, identified during the site investigations and risk assessments, posing a potential risk because of their toxicity and potential routes of exposure to public health and the environment.

Comprehensive Environmental, Response, Compensation, and Liability Act (CERCLA): The law enacted by Congress in 1980 to evaluate and clean up abandoned, hazardous waste sites. The EPA was charged with the mission to implement and enforce CERCLA.

Consent Decree: A legal document, approved by a judge, that formalizes an agreement between the EPA and one or more PRPs outlining the terms by which the response action will take place. A Consent Decree is subject to a public comment period prior to its approval by a judge, and is enforceable as a final judgment by a court.

Contaminant Plume: A column of contamination with measurable horizontal and vertical dimensions that is suspended in and moves with groundwater.

Downgradient: Downstream from the flow of groundwater. The term refers to groundwater flow in the same way that it does to a river's flow.

Groundwater: Water beneath the earth's surface that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water via municipal or domestic wells.

Institutional Controls (ICs): The placement of laws, regulations, restrictions, etc., on a site/property, which assist or assure protection of human health by eliminating exposure pathways.

Maximum Contaminant Levels (MCLs): The maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

Migrate: To move from one area to another—to change location.

Natural Attenuation (NA): Natural attenuation refers to the physical, chemical, and biological processes that reduce the mass, toxicity, volume, or concentrations of contaminants.

Operable Unit (OU): Term for each of a number of separate activities undertaken as part of a Superfund site cleanup.

Operation and Maintenance (O&M): Activities conducted at a site after the construction phase to ensure that the cleanup continues to be effective.

Parts per Billion (ppb): A unit of measurement used to describe levels of contamination. For example, one gallon of solvent in one billion gallons of water is equal to 1 ppb.

Performance Standards: Measurable values in the environment that allow the evaluation of whether a remedial action has met a given objective.

Plume: A body of contaminated groundwater flowing from a specific source.

Potentially Responsible Parties (PRPs): Any individual(s) or company(ies) such as owners, operators, transporters or generators who are potentially responsible for the contamination problems at a Superfund site. Whenever possible, the EPA requires PRPs, through administrative and legal actions, to clean up a hazardous waste site.

Present Worth Analysis: A method of evaluation of expenditures that occurs over different time periods. By discounting all costs to a common base year, the costs for different remedial actions can be compared on the basis of a single figure for each alternative.

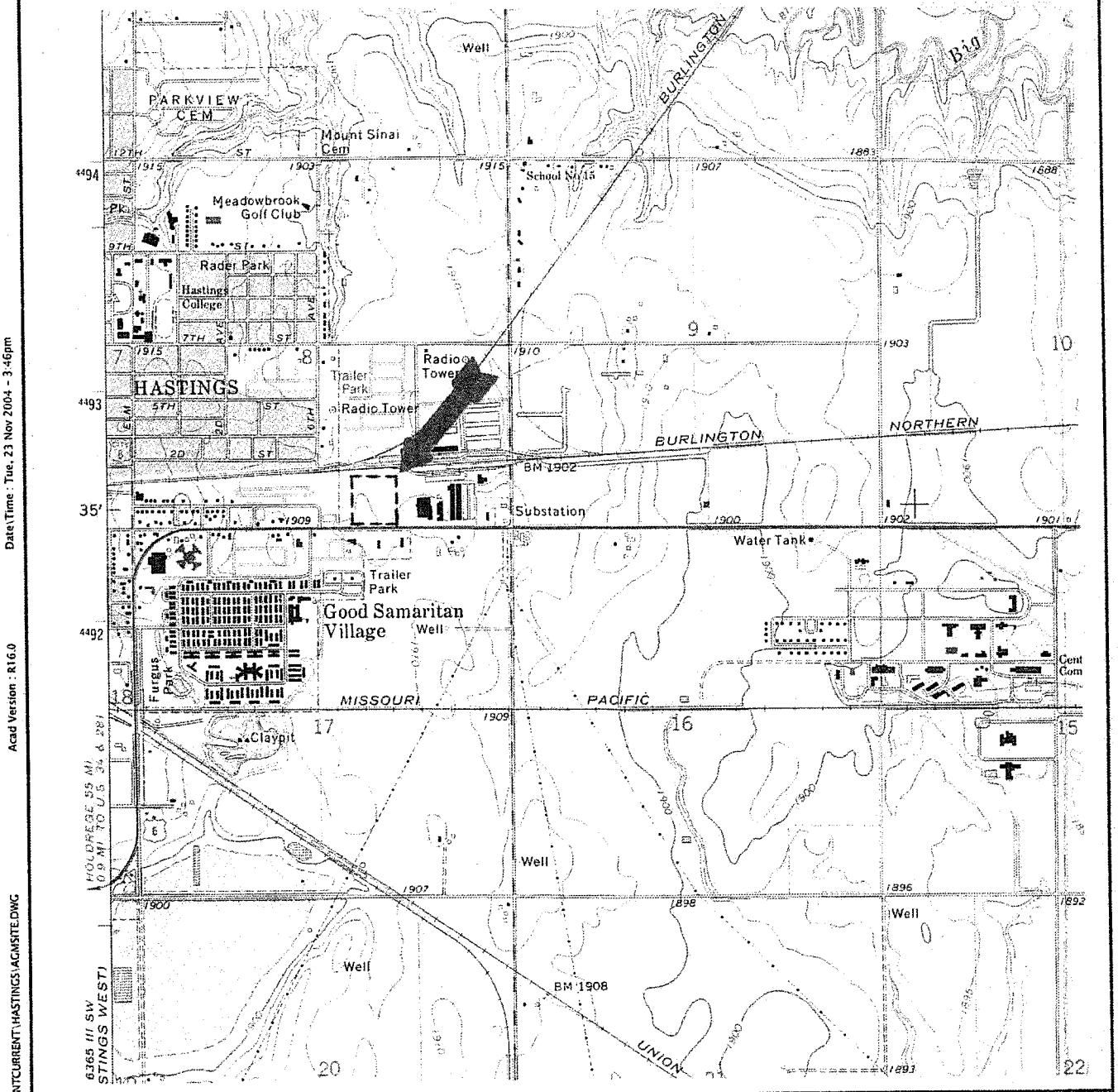
Record of Decision (ROD): The decision document in which the EPA selects the remedy for a Superfund site.

Remedial Action Objective: The specific purpose of a remedial action usually put in terms of measurable standards in environmental media.

Remedial Alternatives: The technology, or combination of technologies, used by the EPA in treating, containing, or controlling contamination at a Superfund site.

Superfund: The nickname given by the press for CERCLA because the program was well funded in the beginning.

Volatile Organic Compounds (VOCs): Carbon compounds such as solvents which readily volatilize at room temperature and atmospheric pressure. Most are not readily dissolved in water, but their solubility is above health-based standards for potable use. Some VOCs can cause cancer.



SOURCE: USGS 7.5 MIN. TOPOGRAPHIC MAP, ADAMS COUNTY, NEBRASKA.

0' 1000' 2000' 4000'

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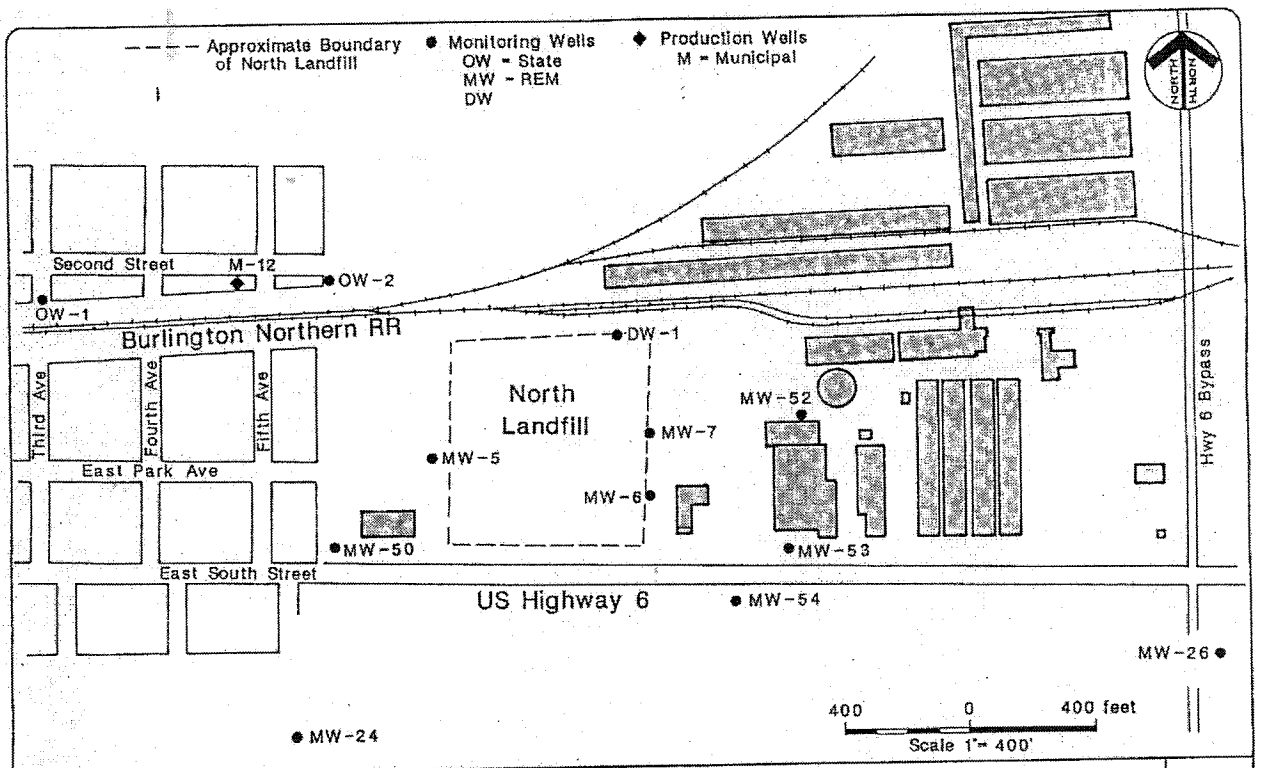
				Department Manager J. KRATZMEYER	Unique Number
				Project Number C1001302.0001	Figure 1

NORTH LANDFILL SUBSITE
U.S. HIGHWAY 6

SITE LOCATION MAP

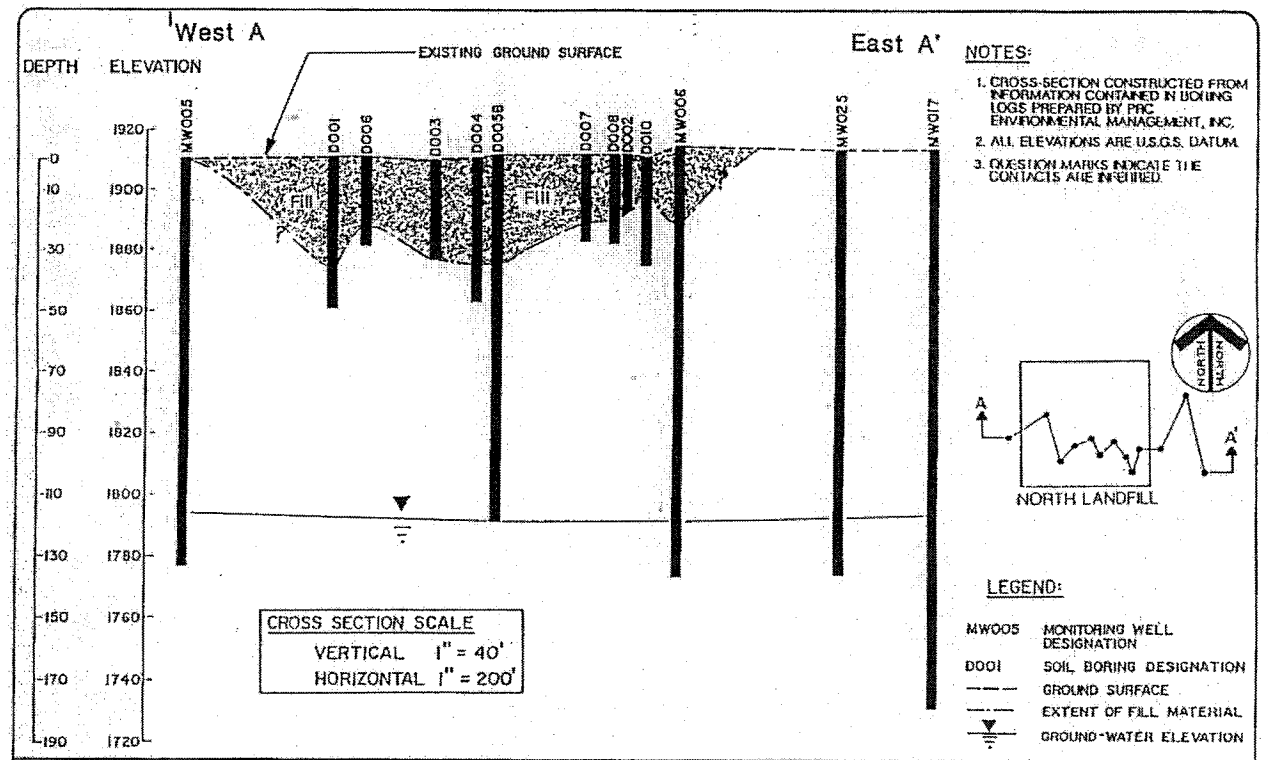
HASTINGS, NEBRASKA



Monitoring and Protection Wells Used to Charaterize and Evaluate the North Landfill
North Landfill, Hastings, Nebraska
Compiled from maps by PRC Environmental Management, Inc. & Gerghty & Miller, Inc.

2

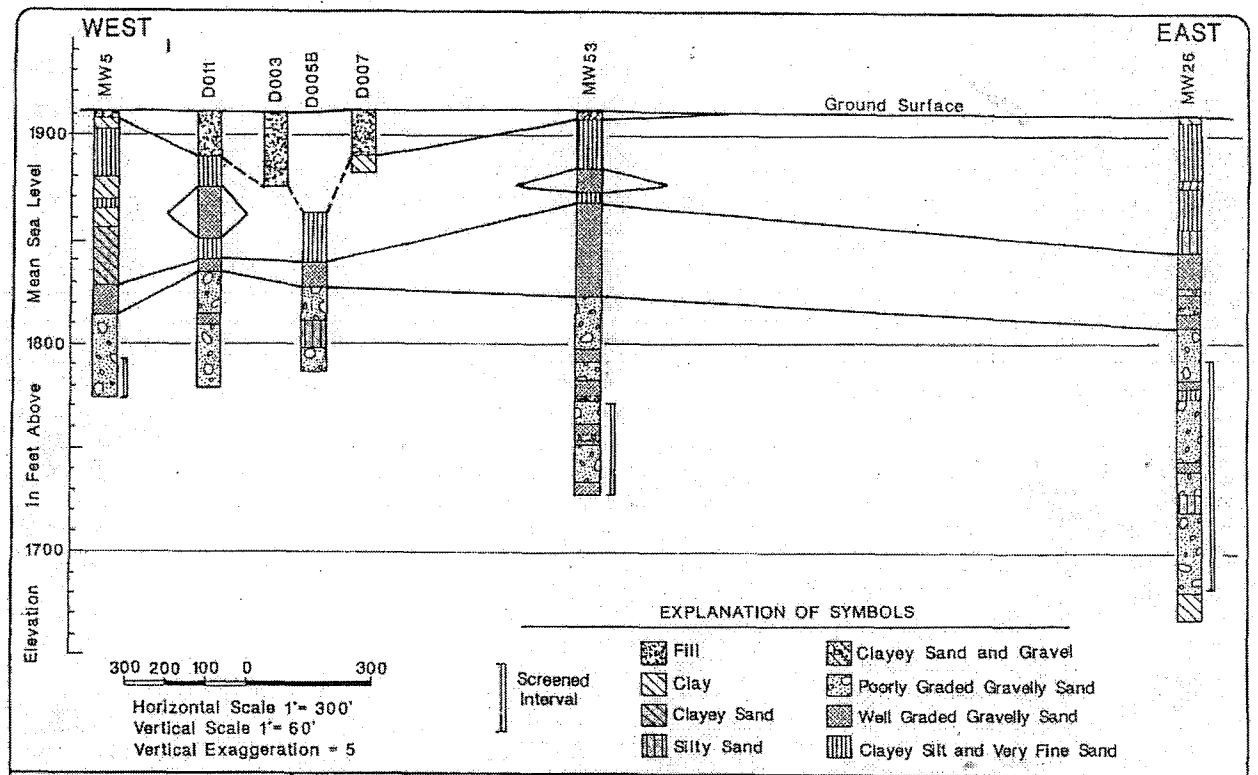
Figure 2



Cross Section Show Fill
North Landfill, Hastings, Nebraska
From a 1989 figure by G&M Consulting Engineers, Inc.
Based on soil boring and well log data from PRC Enviromental Management, Inc.

3

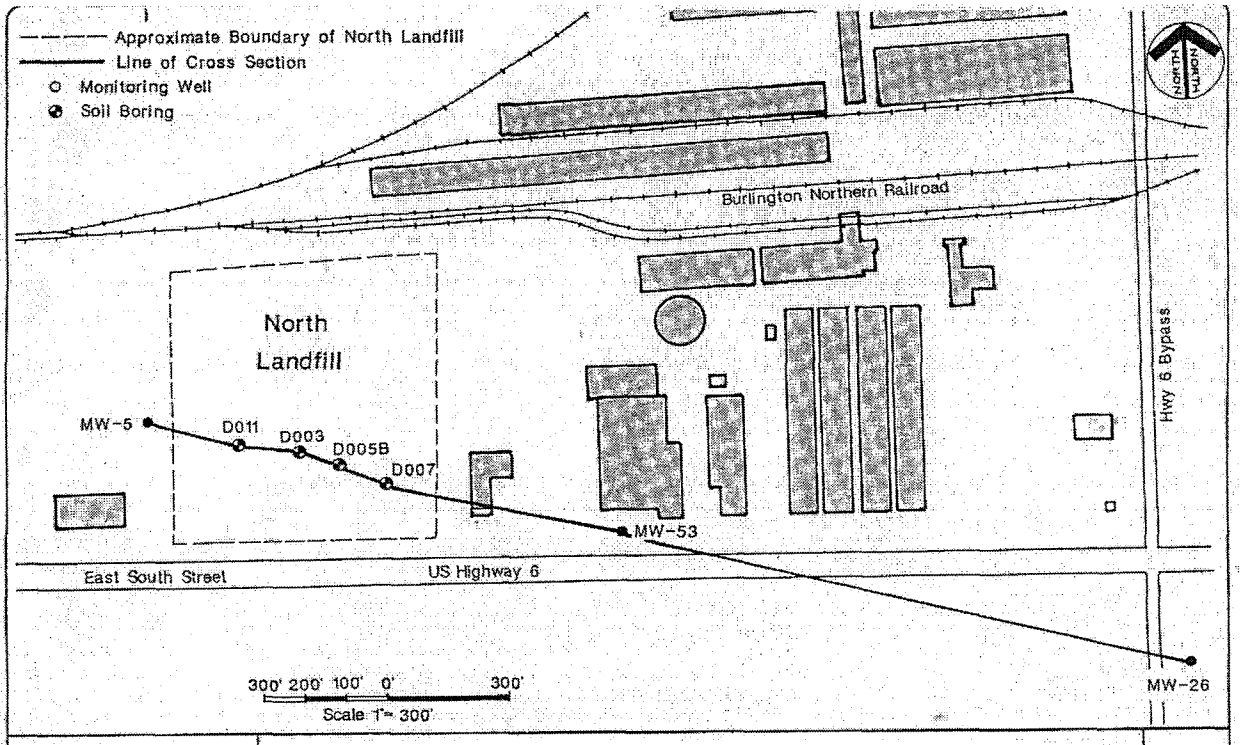
Figure 3



East - West Geologic Cross Section
North Landfill, Hastings, Nebraska
Based on well logs and boring data from PRC Environmental Management, Inc.
& Geraghty & Miller, Inc.

4

Figure 4



Location of East-West Geologic Cross Section
North Landfill, Hastings, Nebraska
Based on a map by Geraghty & Miller, Inc.

5

Figure 5

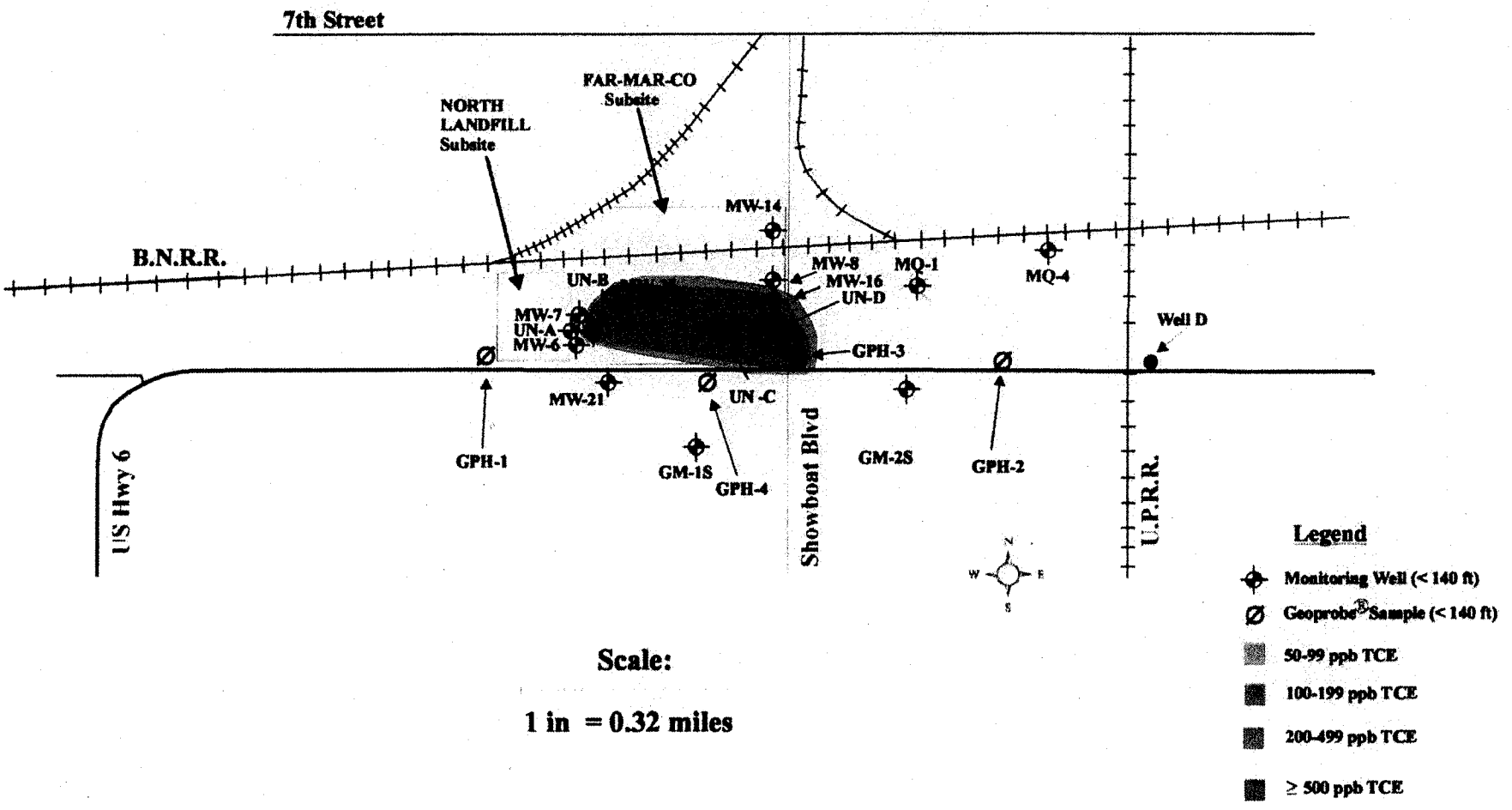


Figure 6. TCE Concentrations in Shallow Ground Water Downgradient of the North Landfill Subsite. (March 2000 monitoring well data; April 2000 Geoprobe data). Hydro-Trace, Inc.

TABLE 1. HISTORIC SAMPLING RESULTS

Sampling Date	MW-5	MW-6	MW-7
March 2001	TCE = < 5	TCE = 31; cis-1,2- DCE = 312; VC = 12	TCE = 27; cis-1,2-DCE = 53
June 2001	NS	TCE = 39; cis-1,2-DCE =298; VC = 14	TCE = 28; cis-1,2-DCE = 44; VC = 2
September 2001	TCE = < 5	TCE = 46; cis-1,2-DCE = 214; VC = 11	TCE = 26; cis-1,2-DCE = 73
December 2001	NS	TCE = 41; cis-1,2-DCE = 162; VC = 11	TCE = 21; cis-1,2-DCE = 53; VC = 4
March 2002	TCE = < 5	TCE = 46; cis-1,2-DCE = 213; VC = 10	TCE = 26; cis-1,2-DCE = 44; VC = 2
June 2002	NS	TCE = 37; cis-1,2-DCE = 154; VC = 6	TCE = 21; cis-1,2-DCE = 46; VC = <2
September 2002	NS	TCE = 36; cis-1,2-DCE = 126; VC = 5	TCE = 18; cis-1,2-DCE = 70; VC = 2
December 2002	NS	TCE = 26; cis-1,2-DCE = 134; VC = 6	TCE = 18; cis-1,2-DCE = 62; VC = 3
March 2003	TCE = 12	TCE = 36; cis-1,2-DCE = 103; VC = 6	TCE = 28; cis-1,2-DCE = 66; VC = 3
June 2003	NS	TCE = 22; cis-1,2-DCE = 152; VC = 7	TCE = 24; cis-1,2-DCE = 64; VC = 3
September 2003	NS	TCE = 17; cis-1,2-DCE = 216; VC = 8	TCE = 9; cis-1,2-DCE = 58; VC = <2
December 2003	NS	TCE = 18; cis-1,2-DCE = 122; VC = 4	TCE = 8; cis-1,2-DCE = 55
March 2004	NS	TCE = 15; cis-1,2-DCE = 131; VC = 4	TCE = 14; cis-1,2-DCE = 32
April 2004	TCE = 330; 1,2-DCE = <10	NS	NS
June 2004	NS	TCE = 18; cis-1,2-DCE = 100; VC = 4	TCE = 24; cis-1,2-DCE = 52
September 2004	NS	TCE = 16; cis-1,2-DCE = 183; VC = 5	TCE = 81; cis-1,2-DCE = 31
December 2004	NS	TCE = 14; cis-1,2-DCE = 167; VC = 5	TCE = 40; cis-1,2-DCE = 18
March 2005	TCE = 208	TCE = 45; cis-1,2-DCE = 114; VC = 4	TCE = 40; cis-1,2-DCE = 22
April 2005	TCE = 150	NS	NS
June 2005	NS	TCE = 89; cis-1,2-DCE = 94; VC = 3	TCE = 58; cis-1,2-DCE = 30; VC = <2
September 2005	NS	TCE = 106; cis-1,2-DCE = 177; VC = 5	TCE = 112; cis-1,2-DCE = 29; VC = <2
December 2005	NS	TCE = 229; cis-1,2-DCE = 102; VC = 3	TCE = 127; cis-1,2-DCE = 24; VC = <2
March 2006	TCE = 40	TCE = 262	TCE = 141
Notes:			
NS = Not Sampled.			

TABLE 2. SUMMARY OF TOXICITY VALUES USED

Chemical	Cancer Slope Factor (mg/kg-day)$^{-1}$		Reference Dose (mg/kg-day)	
	Oral	Inhalation	Oral	Inhalation
Vinyl Chloride	1.5E+00	3.1E-02	3.0E-03	2.9E-02
cis-1,2-Dichloroethene			1.0E-02	1.0E-02

TABLE 3. POTABLE EXPOSURE ASSUMPTIONS FOR OU2 GROUNDWATER

Symbol – Definition	Default
Target Cancer Risk (unitless)	10^{-6}
Target Hazard Quotient (unitless)	1
Body Weight - adult (kg)	70
Body Weight – child (kg)	15
Averaging Time – cancer (days)	25,550
Averaging Time - noncancer (days)	Exposure Duration x 365
Drinking Water Ingestion – adult (L/day)	2
Drinking Water Ingestion – child (L/day)	1
Ingestion Factor – water [(L-yr)/(kg-day)]	1.1
Inhalation Rate – adult (m^3/day)	20
Inhalation Rate – child (m^3/day)	10
Inhalation Rate, air ([(m3-yr)/(kg-day)]	11
Exposure Frequency (days/year)	350
Exposure Duration – residential (yrs)	30
Exposure Duration – adult (yrs)	24
Exposure Duration – child (yrs)	6
Volatilization Factor for Water (L/m^3)	0.5
Cancer Slope Factor – oral (mg/kg-day)$^{-1}$	Chemical Specific
Cancer Slope Factor – inhalation (mg/kg-day)$^{-1}$	Chemical Specific
Reference dose – oral (mg/kg-day)	Chemical Specific
Reference dose – inhalation (mg/kg-day)	Chemical Specific

TABLE 4. OU 2 GROUNDWATER: COMPARISON OF SITE CONCENTRATIONS TO RISK-BASED ACCEPTABLE CONCENTRATIONS

Chemical	Maximum Site Concentration (ppb)	Location (Boring #)	Risk-Based Concentration (ppb)	Max Site Exceeds Risk-Based?
Vinyl chloride	39	MW-6	0.02	**Yes**
Cis-1,2-DCE	600	MW-6	61	**Yes**

TABLE 5. APPLICABLE OR RELEVANT AND APPROPRIATE REGULATIONS (ARARS)

Chemical-Specific ARARs		
Regulation	**Citation**	**Description**
Safe Drinking Water Act (SDWA) Groundwater Quality Standards and Use Classifications	40 CFR, §141.50 - 141.51 and 40 CFR §141.11 - 141.16 Title 118 Chapter 4	These regulations include maximum contaminant levels (MCLs) for each contaminant. Primary drinking water standards promulgated under the SDWA apply to drinking water "at the tap" as delivered by a public water supply system. Title 118 MCLs apply in the groundwater. These same standards are relevant and appropriate to groundwater contamination. These requirements are relevant and appropriate to all three alternatives.
Action-Specific ARARs		
Federal and State RCRA	40 CFR Part 264, Subpart F	Specifies requirements for groundwater monitoring. Applicable to Alternatives 2 and 3.
Federal Clean Air Act Nebraska Air Quality Regulations	33 U.S.C., §1251 et seq. Title 129	Treatment technology standards for emissions to air from air stripper/cooling tower. Applicable to Alternative 3.

TABLE 6. COMPARISON OF ALTERNATIVES

THRESHOLD CRITERIA	ALTERNATIVE G-1 NO ACTION	ALTERNATIVE G-2 GROUND WATER USE RESTRICTIONS + NATURAL ATTENUATION	ALTERNATIVE G-3 #2 + HYDRAULIC CONTAINMENT USING VERTICAL EXTRACTION WELLS, USE AS NON-CONTACT COOLING WATER
1. **PROTECTIVENESS**	Fails protection of human health because it does not monitor or otherwise address GW contamination downgradient of Well D. As a result, the analysis of Alternative 1 ends.	Protective	Protective
2. **COMPLIES WITH ARARS:** • **Chemical-Specific** • **Location-Specific** • **Action Specific**	Not Applicable (refer to Criteria 1)	Complies Not timely Not applicable Complies	Complies Meets MCLs in 5 years Not applicable Complies
BALANCING CRITERIA	**ALTERNATIVE G-1 NO ACTION**	**ALTERNATIVE G-2 GROUND WATER USE RESTRICTIONS + NATURAL ATTENUATION**	**ALTERNATIVE G-3 #2 + HYDRAULIC CONTAINMENT USING VERTICAL EXTRACTION WELLS, USE AS NON-CONTACT COOLING WATER**
3. **LONG-TERM EFFECTIVENESS AND PERMANENCE (LTEP)**	Not Applicable (refer to Criteria 1)	Alternative G-2 provides LTEP	Alternative G-3 provides LTEP
4. **SHORT-TERM EFFECTIVENESS**	Not Applicable (refer to Criteria 1)	Alternative G-2 provides short-term protectiveness	Alternative G-3 provides short-term protectiveness
5. **REDUCTION OF TOXICITY, MOBILITY AND VOLUME (TMV)**	Not Applicable (refer to Criteria 1)	Alternative G-2 provides reduction of TMV through natural attenuation	Alternative G-3 provides reduction of TMV through natural attenuation, and more through treatment at the Whelan Energy Center

THRESHOLD CRITERIA	ALTERNATIVE G-1 NO ACTION	ALTERNATIVE G-2 GROUND WATER USE RESTRICTIONS + NATURAL ATTENUATION	ALTERNATIVE G-3 #2 + HYDRAULIC CONTAINMENT USING VERTICAL EXTRACTION WELLS, USE AS NON-CONTACT COOLING WATER
6. IMPLEMENTABILITY	Not Applicable (refer to Criteria 1)	Alternative G-2 is technically and administratively implementable. The means and procedures for ground water sampling, extraction, and evaluation are available and no administrative opposition is anticipated	Alternative G-3 is technically and administratively implementable. The means and procedures for ground water sampling, extraction, and evaluation are available and no administrative opposition is anticipated
7. COST	Not Applicable (refer to Criteria 1)	The estimated present worth cost is $171,031.	The estimated present worth cost is $591,985. The difference in cost between Alternatives G-2 and G-3 is related to the pumping of Well D and transfer of that water to the Whelan Energy Center for use as non-contact cooling water
MODIFYING CRITERIA	**ALTERNATIVE G-1 NO ACTION**	**ALTERNATIVE G-2 GROUND WATER USE RESTRICTIONS + NATURAL ATTENUATION**	**ALTERNATIVE G-3 #2 + HYDRAULIC CONTAINMENT USING VERTICAL EXTRACTION WELLS, USE AS NON-CONTACT COOLING WATER**
8. STATE ACCEPTANCE	Not Applicable (refer to Criteria 1)	No Comment	The state of Nebraska supported this alternative, identified as the Preferred Alternative, during the Proposed Plan. The State's support was contingent on the reaction received during the public comment period.
9. COMMUNITY ACCEPTANCE (continued)	Not Applicable (refer to Criteria 1)	No Comment	Acceptable. No comments were received to identify otherwise. PRPs indicated resistance to selection of this alternative due to the recent discovery that new contamination from upgradient of the North Landfill has been discovered. This contamination, from a source not associated with North Landfill, should move past the North Landfill within 2 years.

TABLE 7. Cost Estimate for Selected Remedy

ITEM	UNIT	UNIT QUANTITY	UNIT COST ($)	TOTAL COST ($)
1. GROUND WATER USE RESTRICTIONS				
Administrative Costs	LS	1	$15,000.00	$15,000.00
			Subtotal:	**$15,000.00**
2. GROUND WATER EXTRACTION/REUSE				
Capital Repairs	LS	1	$20,000.00	$20,000.00
			Subtotal	**$20,000.00**
3. MONITORING				
Labor, Sampling ($/yr)	LS	1	$22,000.00	$22,000.00
Laboratory Analysis ($/yr)	LS	1	$11,400.00	$11,400.00
Reporting, 4 reports/yr ($/yr)	4 reports	1	$8,000.00	$32,000.00
			Subtotal	**$65,400.00**
4. O & M				
Visits/Repairs ($/yr)	LS	1	$20,000.00	$20,000.00
Power Costs ($/yr)	Month	12	$650.00	$7,800.00
			Subtotal	**$27,800.00**
5. CONTINGENCIES			20 % of cost	
6. PROJECT MANAGEMENT			15 % of cost	
			CAPITAL COSTS TOTAL:	**$47,250.00**
			ANNUAL COST TOTAL:	**$125,820.00**
			PRESENT VALUE TOTAL:	**$591,985.00**

RECORD OF DECISION

RESPONSIVENESS SUMMARY

HASTINGS GROUNDWATER CONTAMINATION SITE
NORTH LANDFILL SUBSITE
HASTINGS, NEBRASKA

PREPARED BY:

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION VII
KANSAS CITY, KANSAS

AUGUST 2006

RESPONSIVENESS SUMMARY

TABLE OF CONTENTS

	PAGE
1. OVERVIEW	3
2. BACKGROUND ON COMMUNITY INVOLVEMENT	3
3. SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD	4
3.1. ORAL COMMENTS RECEIVED DURING THE PUBLIC MEETING	4
3.2. WRITTEN COMMENTS RECEIVED	5
3.2.1. FROM INTERESTED CITIZENS	5
3.2.2. FROM POTENTIALLY RESPONSIBLE PARTIES	5

RESPONSIVENESS SUMMARY
HASTINGS GROUNDWATER CONTAMINATION SITE
NORTH LANDFILL SUBSITE
HASTINGS, NEBRASKA

1 OVERVIEW

The U.S. Environmental Protection Agency (EPA), with concurrence from the Nebraska Department of Environmental Quality (NDEQ), made a preliminary selection of the preferred remedial alternative in the Proposed Plan. The preferred remedial alternative addressed contaminated groundwater for Operable Unit 2 (OU 2) of the Hastings North Landfill Subsite (Subsite). The treatment technologies included within the preferred alternative were: (1) groundwater use restrictions; (2) hydraulic containment using vertical extraction wells; and (3) use of extracted water as non-contact cooling water at the Whelan Energy Center.

The comments received from representatives of potentially responsible parties[1] who attended the public meeting (held on April 17, 2006) in Hastings primarily concerned the desire of these parties to invalidate the preferred alternative from the Feasibility Study (FS) on the basis of recently changed conditions within the aquifer. Section 3.1 presents a detailed summary of those questions and responses. There were no comments received from general members of the public.

The EPA received written comments from two parties: Hydro-Trace Inc. (on behalf of the city of Hastings and Dutton-Lainson Company) and Dravo Corporation. Readers are directed to Section 3.2 for a detailed summary of those comments.

2 BACKGROUND ON COMMUNITY INVOLVEMENT

The FS and the Proposed Plan for OU 2 were released to the public on April 10, 2006. The Administrative Record (which includes numerous remedial investigation documents, the FS report, and the Proposed Plan) was made available for public review at the information repositories maintained at the Hastings Public Library and at the EPA's Region 7 office in Kansas City, Kansas. The notice of availability of the Administrative Record was published in The Hastings Tribune on both April 11 and April 15, 2006. The public comment period on the Proposed Plan ran for 30 days from April 10 to May 9, 2006, with a 10-day extension granted to allow additional time to submit comments.

[1] Potentially responsible parties at the North Landfill Subsite are the City of Hastings, Dutton-Lainson Company, Dravo Corporation, and the U.S. Navy.

A public meeting was held by the EPA and the NDEQ on April 17, 2006, in the Hastings Public Library. Over 1,100 letters were sent to citizens of Hastings advertising the meeting. Interested citizens were given the opportunity to hear a summary of the Proposed Plan and to provide comments or ask questions concerning the investigations or remedial alternatives. A transcript of the public meeting was made. At this meeting the EPA and the NDEQ representatives answered questions about problems at the Subsite and the Superfund remedial process.

3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD

3.1 Oral Comments Received during the Public Meeting

Comments and responses provided here are paraphrased from the transcript of the public meeting which is part of the Administrative Record.

Comment #1

Reassessment of the North Landfill data recently has revealed that the intrinsic remediation which was occurring in the groundwater has been interrupted due to the intrusion of contamination from an upgradient source into the North Landfill. The natural attenuation (NA) which was occurring would have been complete by this time were it not for the upgradient air sparging, which has caused trichloroethene (TCE)[2] levels in the groundwater downgradient of North Landfill to have returned to their original TCE concentrations.

Response

EPA agrees the data indicates an upgradient source of TCE contamination in the groundwater has been intercepted by the North Landfill monitoring wells. The EPA believes, however, this phenomenon will be temporary.

Comment #2

It is clear given all the history of all the sampling in this area that the EPA should be able to make the determination that this is upgradient contamination that is now showing up in these wells and that, really, the North Landfill Subsite has come full circle and pretty much remediated to Maximum Contaminant Levels (MCLs)[3] to meet the state applicable or relevant and appropriate requirements (ARARs).[4]

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[2] TCE or trichloroethene is a contaminant of concern at the North Landfill.

[3] MCLs are the maximum contaminant levels established under the Safe Drinking Water Act. The National Contingency Plan requires that a remedy be protective of human health and the environment. To achieve that goal, this ROD states that MCLs are the cleanup goals for the contaminants of concern.

[4] ARARs refer to applicable or relevant and appropriate requirements (laws, regulations, standards, etc.)

Response

EPA agrees in part. The TCE levels had been decreasing, although at the lowest levels detected, they exceeded MCLs. The EPA agrees there is an upgradient source that in the past year and a half has affected the levels of TCE at the North Landfill. The EPA believes this is a temporary phenomenon. The EPA does not agree with the comment the Subsite is ready for closure. The current data indicate continued operation of Well D is necessary until data show the levels of the contaminants of concern are maintained at or below MCLs .

Comment #3

The PRP group has remediated and remediated and spent a lot of money doing it. Under the Superfund and under everything used for measurement, it's time to put closure to some of these sites, and this North Landfill is one of these sites which is ready for closure. If Well D is going to operate for some period of time to give the added protection of additional remediation, that's fine, but this Record of Decision and the conclusions of the Agency ought to be closure. It has been demonstrated in the five-year report, in everything that has transpired over the years since the landfill was capped, and since Well D has been pumping, that this Subsite is ready for closure.

Response

See Response # 1 and # 2.

3.2 Written Comments Received

3.2.1 From Interested Citizens

None received.

3.2.2 Written Comments from PRPs

Two letters were received in which PRPs provided comments. The first was from Roy Spalding of Hydro-Trace, Inc., on behalf of PRPs the City of Hastings and Dutton-Lainson Company. The second was from Dravo Corporation another PRP.
The Hydro-Trace letter provided the following comments:

1. The City and Dutton-Lainson are very concerned about the recent interception by the North Landfill monitoring wells of moderately high TCE concentrations from an upgradient source;

2. The recent excursions of the upgradient TCE into the North Landfill Subsite area have effectively ended any ability to gauge the ongoing effectiveness of NA in

remediating contamination originating at or in connection with the North Landfill Subsite; and

3. Historical sampling data indicated that the Subsite would have been remediated to concentrations near or below maximum contaminant levels by the end of 2006 had there not been an upgradient source.

Response

EPA agrees that there is an upgradient source impacting the North Landfill monitoring wells but believes this phenomenon will be temporary.

The EPA does not agree with the comment that the Subsite is ready for closure. The current data indicate that continued operation of Well D is necessary until data show that the levels of the contaminants of concern are maintained at or below MCLs.

The Dravo letter provided the following comments:

1. Dravo agrees with the EPA's Proposed Plan;

2. At this time, evidence of possible North Landfill contributions to the deeper groundwater contamination is unknown. However, Dravo believes there may be some residual source from the North Landfill that has traveled vertically downward past the shallow leachate plume, contributing contaminant mass to the deeper plume;

3. Dravo disagrees with other comments that this Subsite is ready for closure insofar as the commenter suggested a no action alternative should be selected as the preferred remedy;

4. The current concentration levels at the North Landfill are most likely temporary and they are expected to decrease with time as optimization of the upgradient treatment system(s) occurs; and
5. Dravo disagrees with a comment at the public meeting that an addendum to the feasibility study should be conducted.

Response

EPA agrees that data indicate an upgradient source of TCE contamination in the groundwater has been intercepted by the North Landfill monitoring wells.

EPA agrees with the comment that there is no need for an addendum to the feasibility study.